Changing PWM Frequency on the Arduino

There is a very good tutorial HERE:

Credits for the below: http://usethearduino.blogspot.com

On the Arduino Duemilanove/UNO etc., pins 3,5,6, 9, 10, 11 can be configured for PWM output.

The 8-bit PWM value that you set when you call the analogWrite function:

```
analogWrite(myPWMpin, 128); Outputs a square wave
```

is compared against the value in an 8-bit counter. When the counter is less than the PWM value, the pin outputs a HIGH; when the counter is greater than the PWM value, the pin outputs a LOW. In the example above, a square wave is generated because the pin is HIGH from counts 0 to 127, and LOW from counts 128 to 255, so it is HIGH for the same amount of time it is LOW.

It follows logically that the frequency of the PWM signal is determined by the speed of the counter. Assuming you are using an Atmega168 with the Arduino Diecimila bootloader burned on it (which is exactly what you are using if you bought an Arduino Diecimila), this counter's clock is equal to the sytem clock divided by a prescaler value. The prescaler is a 3-bit value stored in the three least significant bits of the Timer/Counter register: `CS02`, `CS01`, and `CS00`. There are three such Timer/Counter registers: `TCCR0B`, `TCCR1B`, and `TCCR2B`.

Since there are three different prescalers, the six PWM pins are broken up into three pairs, each pair having its own prescaler. For instance, Arduion pins 6 and 5 are both controlled by TCCR0B, so you can set Arduino pins 6 and 5 to output a PWM signal at one frequency. Arduino pins 9 and 10 are controlled by TCCR1B, so they can be set at a different frequency from pins 6 and 5. Arduino pins 11 and 3 are controlled by TCCR2B, so they may be set at a third frequency. But you can't set different frequencies for pins that are controlled by the same prescaler (e.g. pins 6 and 5 must be at the same frequency).

If you use the default values set by the Arduino Diecimila's bootloader, these are your PWM frequencies:

Arduino Pins 5 and 6: 1kHz
Arduino Pins 9, 10, 11, and 3: 500Hz

How do you change the PWM frequency?

In the `void setup()` part of your Arduino code, set or clear the `CS02`,`CS01`, and `CS00` bits in the relevant `TCCRnB` register.

```
// For Arduino Uno, Nano, Micro Magician, Mini Driver, Lilly Pad and any other board using ATmega 8, 168 or 328**

//---------------------------------------------- Set PWM frequency for D5 & D6 -------------------------------

//TCCR0B = TCCR0B & B11111000 | B00000001;    // set timer 0 divisor to     1 for PWM frequency of 62500.00 Hz
//TCCR0B = TCCR0B & B11111000 | B00000010;    // set timer 0 divisor to     8 for PWM frequency of  7812.50 Hz
  TCCR0B = TCCR0B & B11111000 | B00000011;    // set timer 0 divisor to    64 for PWM frequency of   976.56 Hz (The DEFAULT)
//TCCR0B = TCCR0B & B11111000 | B00000100;    // set timer 0 divisor to   256 for PWM frequency of   244.14 Hz
//TCCR0B = TCCR0B & B11111000 | B00000101;    // set timer 0 divisor to  1024 for PWM frequency of    61.04 Hz
```

```
//---------------------------------------------- Set PWM frequency for D9 & D10 ------------------------------

//TCCR1B = TCCR1B & B11111000 | B00000001;    // set timer 1 divisor to     1 for PWM frequency of 31372.55 Hz
//TCCR1B = TCCR1B & B11111000 | B00000010;    // set timer 1 divisor to     8 for PWM frequency of  3921.16 Hz
  TCCR1B = TCCR1B & B11111000 | B00000011;    // set timer 1 divisor to    64 for PWM frequency of   490.20 Hz (The DEFAULT)
//TCCR1B = TCCR1B & B11111000 | B00000100;    // set timer 1 divisor to   256 for PWM frequency of   122.55 Hz
//TCCR1B = TCCR1B & B11111000 | B00000101;    // set timer 1 divisor to  1024 for PWM frequency of    30.64 Hz

//---------------------------------------------- Set PWM frequency for D3 & D11 ------------------------------

//TCCR2B = TCCR2B & B11111000 | B00000001;    // set timer 2 divisor to     1 for PWM frequency of 31372.55 Hz
//TCCR2B = TCCR2B & B11111000 | B00000010;    // set timer 2 divisor to     8 for PWM frequency of  3921.16 Hz
//TCCR2B = TCCR2B & B11111000 | B00000011;    // set timer 2 divisor to    32 for PWM frequency of   980.39 Hz
  TCCR2B = TCCR2B & B11111000 | B00000100;    // set timer 2 divisor to    64 for PWM frequency of   490.20 Hz (The DEFAULT)
//TCCR2B = TCCR2B & B11111000 | B00000101;    // set timer 2 divisor to   128 for PWM frequency of   245.10 Hz
//TCCR2B = TCCR2B & B11111000 | B00000110;    // set timer 2 divisor to   256 for PWM frequency of   122.55 Hz
//TCCR2B = TCCR2B & B11111000 | B00000111;    // set timer 2 divisor to  1024 for PWM frequency of    30.64 Hz



//For Arduino Mega1280, Mega2560, MegaADK, Spider or any other board using ATmega1280 or ATmega2560**

//---------------------------------------------- Set PWM frequency for D4 & D13 ------------------------------

//TCCR0B = TCCR0B & B11111000 | B00000001;    // set timer 0 divisor to     1 for PWM frequency of 62500.00 Hz
//TCCR0B = TCCR0B & B11111000 | B00000010;    // set timer 0 divisor to     8 for PWM frequency of  7812.50 Hz
  TCCR0B = TCCR0B & B11111000 | B00000011;    <// set timer 0 divisor to    64 for PWM frequency of   976.56 Hz (Default)
//TCCR0B = TCCR0B & B11111000 | B00000100;    // set timer 0 divisor to   256 for PWM frequency of   244.14 Hz
//TCCR0B = TCCR0B & B11111000 | B00000101;    // set timer 0 divisor to  1024 for PWM frequency of    61.04 Hz


//---------------------------------------------- Set PWM frequency for D11 & D12 ------------------------------

//TCCR1B = TCCR1B & B11111000 | B00000001;    // set timer 1 divisor to     1 for PWM frequency of 31372.55 Hz
//TCCR1B = TCCR1B & B11111000 | B00000010;    // set timer 1 divisor to     8 for PWM frequency of  3921.16 Hz
  TCCR1B = TCCR1B & B11111000 | B00000011;    // set timer 1 divisor to    64 for PWM frequency of   490.20 Hz
//TCCR1B = TCCR1B & B11111000 | B00000100;    // set timer 1 divisor to   256 for PWM frequency of   122.55 Hz
//TCCR1B = TCCR1B & B11111000 | B00000101;    // set timer 1 divisor to  1024 for PWM frequency of    30.64 Hz

//---------------------------------------------- Set PWM frequency for D9 & D10 ------------------------------

//TCCR2B = TCCR2B & B11111000 | B00000001;    // set timer 2 divisor to     1 for PWM frequency of 31372.55 Hz
//TCCR2B = TCCR2B & B11111000 | B00000010;    // set timer 2 divisor to     8 for PWM frequency of  3921.16 Hz
//TCCR2B = TCCR2B & B11111000 | B00000011;    // set timer 2 divisor to    32 for PWM frequency of   980.39 Hz
  TCCR2B = TCCR2B & B11111000 | B00000100;    // set timer 2 divisor to    64 for PWM frequency of   490.20 Hz
//TCCR2B = TCCR2B & B11111000 | B00000101;    // set timer 2 divisor to   128 for PWM frequency of   245.10 Hz
//TCCR2B = TCCR2B & B11111000 | B00000110;    // set timer 2 divisor to   256 for PWM frequency of   122.55 Hz
```

```
//TCCR2B = TCCR2B & B11111000 | B00000111;    // set timer 2 divisor to  1024 for PWM frequency of    30.64 Hz


//---------------------------------------------- Set PWM frequency for D2, D3 & D5 --------------------------

//TCCR3B = TCCR3B & B11111000 | B00000001;    // set timer 3 divisor to     1 for PWM frequency of 31372.55 Hz
//TCCR3B = TCCR3B & B11111000 | B00000010;    // set timer 3 divisor to     8 for PWM frequency of  3921.16 Hz
  TCCR3B = TCCR3B & B11111000 | B00000011;    // set timer 3 divisor to    64 for PWM frequency of   490.20 Hz
//TCCR3B = TCCR3B & B11111000 | B00000100;    // set timer 3 divisor to   256 for PWM frequency of   122.55 Hz
//TCCR3B = TCCR3B & B11111000 | B00000101;    // set timer 3 divisor to  1024 for PWM frequency of    30.64 Hz


//---------------------------------------------- Set PWM frequency for D6, D7 & D8 --------------------------

//TCCR4B = TCCR4B & B11111000 | B00000001;    // set timer 4 divisor to     1 for PWM frequency of 31372.55 Hz
//TCCR4B = TCCR4B & B11111000 | B00000010;    // set timer 4 divisor to     8 for PWM frequency of  3921.16 Hz
  TCCR4B = TCCR4B & B11111000 | B00000011;    // set timer 4 divisor to    64 for PWM frequency of   490.20 Hz
//TCCR4B = TCCR4B & B11111000 | B00000100;    // set timer 4 divisor to   256 for PWM frequency of   122.55 Hz
//TCCR4B = TCCR4B & B11111000 | B00000101;    // set timer 4 divisor to  1024 for PWM frequency of    30.64 Hz


//---------------------------------------------- Set PWM frequency for D44, D45 & D46 -----------------------

//TCCR5B = TCCR5B & B11111000 | B00000001;    // set timer 5 divisor to     1 for PWM frequency of 31372.55 Hz
//TCCR5B = TCCR5B & B11111000 | B00000010;    // set timer 5 divisor to     8 for PWM frequency of  3921.16 Hz
  TCCR5B = TCCR5B & B11111000 | B00000011;    // set timer 5 divisor to    64 for PWM frequency of   490.20 Hz
//TCCR5B = TCCR5B & B11111000 | B00000100;    // set timer 5 divisor to   256 for PWM frequency of   122.55 Hz
//TCCR5B = TCCR5B & B11111000 | B00000101;    // set timer 5 divisor to  1024 for PWM frequency of    30.64 Hz
```